



# MACHAKOS UNIVERSITY

University Examinations for 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN INFORMATION COMMUNICATION TECHNOLOGY

1920/106: OPERATING SYSTEM

DATE: 18/4/2019

TIME: 8.30-11.30 AM

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## INSTRUCTIONS

1. Answer **Any five (5)** questions
2. All the questions carry twenty (20) marks each
3. This paper consists of FIVE (5) printed pages

## QUESTION ONE (20 MARKS)

- a) Discuss any **two** roles played by operating system while implementing the following functions associated with computer based systems.
  - i. Programs and subroutines loading (2 marks)
  - ii. Processor Management (2 marks)
  - iii. Main Memory Management (2 marks)
- b) Describe any **three** reasons that would cause an executing process to terminate. (6 marks)
- c) Explain how priority scheduling algorithm deals with the problem of starvation on processes with lower priority. (2 marks)
- d) Suppose we have 4 processes that arrived in the order P1, P2, P3 and P4 and their burst times is as provided.

| Process | Arrival Time | Burst Time |
|---------|--------------|------------|
| P1      | 0            | 5          |
| P2      | 2            | 8          |
| P3      | 3            | 4          |
| P4      | 4            | 1          |

Considering the First Come First Served (FCFS) scheduling algorithm,

- i. Draw the Gantt chart; (2 marks)
- ii. Calculate the average waiting time for the processes; (2 marks)
- iii. Calculate the average turn around time. (2 marks)

### QUESTION TWO (20 MARKS)

- a) With the help of a diagram, explain the various process states. (8 marks)
- b) Operating system employs a number of strategies to determine where to place incoming process. Critically discuss any two memory placement strategies that can be employed to achieve this. (4 marks)
- c) Priority scheduling algorithm is both pre-emptive and non-pre-emptive. Explain how this is achieved. (4 marks)
- d) Assuming a 2 kb page size and the virtual page 2 is mapped onto the physical page frame 4, identify the physical address which will be accessed when a program tries to access address 5002. (4 marks)

### QUESTION THREE (20 MARKS)

- a) Suppose we have 4 processes with the following their burst times.

| Process | Burst Time |
|---------|------------|
| P1      | 8          |
| P2      | 9          |
| P3      | 5          |
| P4      | 2          |

Considering the round robin scheduling algorithm with a Quantum time of 3,

- i. Draw the Ghant chart for the schedule (3 marks)
  - ii. Calculate the average waiting time for the processes; (2 mark)
  - iii. Calculate the average turn around time. (2 marks)
  - iv. Calculate the throughput of the system. (1 mark)
- b) Critically discuss the **four** conditions that must exist for a deadlock to take place. (8 marks)
- c) Differentiate between contiguous and non-contiguous memory allocation. (4 marks)

#### QUESTION FOUR (20 MARKS)

- a) Explain each of the following with reference to inter-process communication:
- i. Critical sections;
  - ii. Busy waiting;
  - iii. Kernel. (6 marks)
- b) Explain any **two** limitations associated with Shortest Job First scheduling algorithm. (4 marks)
- c) In a paged-segmented system we have the virtual address space of 32 KB, with 8 segments and a page size of 512 bytes. Calculate:-
- i. The number of bits for the page number;
  - ii. The maximum number of pages in a segment;
  - iii. The maximum segment size;
  - iv. Draw how the logical address is partitioned. (8 marks)
- d) Describe the use of *semaphores* in management of concurrent process. (2 marks)

#### QUESTION FIVE (20 MARKS)

- a) Maendeleo Institute is experiencing data privacy problems within its file system. Explain **three** measures that the institute can put in place to mitigate this problem. (6 marks)
- b) Access to disk is much slower than access to memory, as a result of this difference many file systems have been designed with various optimizations to improve performance. Describe any **two** of this optimization techniques. (4 marks)
- c) Explain the following file operations:
- i. Append;

- ii. Write;
  - iii. Seek. (6 marks)
- d) Differentiate between *one level* and *two level* directory systems. (4 marks)

**QUESTION SIX (20 MARKS)**

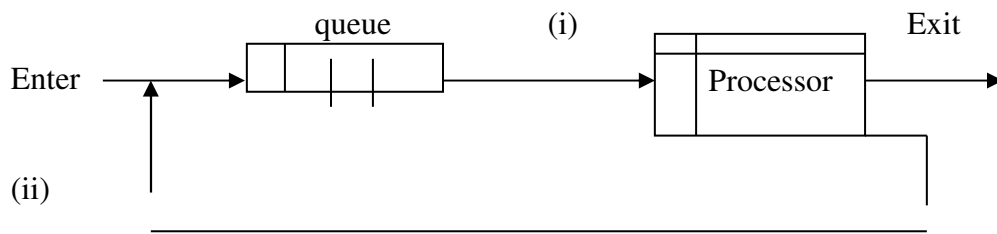
- a) Describe **four** main functions of an operating system. (4 marks)
- b) Explain the following types of operating systems:
  - i. Real time operating systems;
  - ii. Distributed operating System. (4 marks)
- c) While preventing deadlock from happening, explain how the hold and wait condition can be eliminated. (2 marks)
- d) With reference to variable partition, discuss any **two** techniques which can be employed by Operating System to handle external Fragmentation. (4 marks)
- e) Outline **four** ways in which external devices mainly differ in reference to device management (4 marks)
- f) Explain the term *swapping* as used in memory management. (2 marks)

**QUESTION SEVEN (20 MARKS)**

- a) Differentiate between *virtual* and *physical* memory addressing as used in operating systems. (4 marks)
- b) June was required to list objectives for a proposed file system in her company, outline **four** objectives that she was likely to list. (4 marks)
- c) Outline **two** features of FAT16 file system. (2 marks)
- d) Explain each of the following terms as used in I/O operations:
  - i. Spooling;
  - ii. Device controller;
  - iii. Device driver. (6 marks)
- e) ICT module 1 students in Machakos University College were carrying out an assignment on objectives of memory management in operating systems. Explain **four** objectives that they could have mentioned. (4 marks)

**QUESTION EIGHT (20 MARKS)**

- a) Distinguish between *command Language* and *Job control Languages* (4 marks)
- b) Explain the following terms in relation to deadlocks:
  - i. Two phase locking
  - ii. Starvation
  - iii. Safe and unsafe states (6 marks)
- c) Explain the following terms as used in operating systems
  - i. Process
  - ii. Through put
  - iii. Turn around time (6 marks)
- d) The figure below shows a block diagram of a two state process diagram. Outline the role of the parts labelled (i) and (ii)



(4 marks)